This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method for determining overlay between a plurality of first structures in a first layer of a sample and a plurality of second structures in a second layer of the sample, the method comprising:

providing targets A, B, C and D that each include a portion of the first and second structures,

wherein the target A is designed to have an offset Xa between its first and second structures portions,

wherein the target B is designed to have an offset Xb between its first and second structures portions,

wherein the target C is designed to have an offset Xc between its first and second structures portions,

wherein the target D is designed to have an offset Xd between its first and second structures portions,

wherein each of the offsets Xa, Xb, Xc and Xd is different from zero, Xa is an opposite sign and differ from Xb, and Xc is an opposite sign and differs from Xd;

illuminating the targets A, B, C and D with electromagnetic radiation to obtain spectra S_A, S_B, S_C, and S_D from targets A, B, C, and D, respectively; and

determining and storing any overlay error between the first structures and the second structures using a scatterometry technqiue ~~linear approximation~~ based on the obtained spectra S_A, S_B, S_C, and S_D,

wherein obtaining the spectra S_A, S_B, S_C, and S_D comprises acquiring radiation from the targets A, B, C, and D using an optical apparatus that comprising (i) a spectroscopic normal incidence reflectometer and an oblique incidence spectroscopic ellipsometer (ii) a

spectroscopic normal incidence polarized reflectometer and an oblique incidence spectroscopic ellipsometer, (iii) a spectroscopic normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer or (iv) a spectroscopic near-normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer

2. (original) The method of claim 1, wherein determining any overlay error comprises:

determining a difference spectrum D1 from the spectra S_A and S_B;

determining a difference spectrum D2 from the spectra S_C and S_D;

determining any overlay error by performing a linear approximation based on the difference spectra D1 and D2.

3. (original) The method as recited in claim 2, wherein the linear approximation is based on a property P1 of the difference spectrum D1 and a property P2 of the difference spectrum D2.

4. (original) The method of claim 1, wherein each of the targets A, B, C, and D comprises a grating structure Ga1 having periodic structures with a period Ta1 disposed at least partially within the first layer and a grating structure Ga2 having periodic structures with a period Ta2 disposed at least partially within the second layer, wherein the first period Ta1 and the second period Ta2 are substantially identical, and wherein the offsets Xa, Xb, Xc, and Xd are each produced by offsetting the structures with the period Ta1 of the grating structure Ga1 with respect to the structures with the period Ta2 of the grating structure Ga2 by the sum of a first distance F and a second distance f0, wherein the second distance f0 has a smaller absolute value than the first distance F.

5. (original) The method of claim 1, wherein the targets A, B, C and D are disposed along a substantially straight line.

6. (original) The method of claim 5, wherein the target B is disposed between the target A and the target C, and the target C is disposed between the target B and the target D.

7. (original) The method of claim 1, wherein the targets A, B, C and D are disposed in a two dimensional configuration.

8. (original) The method of claim 7, wherein the targets A and B are disposed along a first axis, the targets C and D are disposed along a second axis, and the first axis and the second axis are substantially parallel.

9. (original) The method of claim 1, the method further comprising:

producing an additional target E, the additional target E including a portion of the first and second structures with an offset Y there between;

illuminating the additional target E with electromagnetic radiation to obtain spectra S_E; and

wherein the determining any overlay error is further based on the spectrum S_E.

10-31. (cancelled).

32. (currently amended) The method of claim 1 ~~claim 10~~, wherein the optical apparatus ~~is a system~~ includes ~~comprising~~ a spectroscopic normal incidence reflectometer and an oblique incidence spectroscopic ellipsometer.

33. (currently amended) The method of claim 1 ~~claim 10~~, wherein the optical apparatus ~~is a system~~ includes ~~comprising~~ a spectroscopic normal incidence polarized reflectometer and an oblique incidence spectroscopic ellipsometer.

34. (currently amended) The method of claim 1 ~~claim 10~~, wherein the optical apparatus ~~is a system with~~ includes ~~comprising~~ a spectroscopic normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer.

35. (currently amended) The method of claim 1 ~~claim 10~~, wherein the optical apparatus ~~is a system~~ includes ~~comprising~~ a spectroscopic near-normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer.

36-39. (cancelled)

40. (original) The method of claim 1, wherein at least one of the spectra S_A, S_B, S_C, and S_D comprises electromagnetic radiation that is unpolarized or selectively polarized or selectively analyzed.

41. (original) The method of claim 1, wherein at least one of the spectra S_A, S_B, S_C, and S_D comprises electromagnetic radiation that is unpolarized reflected light, polarized light with the electric field substantially parallel to a symmetry axis of at least one set of structures of at least one of the targets A, B, C or D, polarized light with the electric field substantially perpendicular to a symmetry axis of at least one set of structures of at least one of the targets A, B, C or D, polarized light with the electric field at an angle with respect to a symmetry axis of at least one set of structures of at least one of the targets A, B, C or D, right-hand circularly polarized radiation, or left-hand circularly polarized radiation.

42. (original) The method of claim 3, wherein the properties P1 and P2 of the difference spectra D1 and D2 each are selected from a group consisting of light noise, stability, drift, spectral characteristics, and light level.

43. (original) The method of claim 1, wherein the illuminating the targets A, B, C and D with electromagnetic radiation takes place substantially at different times such that the corresponding spectra S_A, S_B, S_C, and S_D are obtained at substantially different times.

44. (original) The method of claim 1, wherein the illuminating the targets A, B, C and D with electromagnetic radiation takes place substantially simultaneously such that the corresponding spectra S_A, S_B, S_C, and S_D are produced substantially simultaneously.

45. (original) The method of claim 1, wherein the illuminating the targets A, B, C and D with electromagnetic radiation takes place substantially simultaneously for at least two of the targets A, B, C and D.

46. (original) The method of claim 3 where determining the properties P1 and P2 comprises obtaining or processing one or more of radiation characteristics of the difference spectra D1 and D2, respectively, selected from a group consisting of intensity, spectral intensity of diffracted radiation, R(lambda) of different radiation, spectral intensity of transverse electric field polarization R(Te, lambda), spectral intensity of transverse magnetic field polarization R(Tm, lambda), spectral intensity of S-polarization reflectivity Rs (lambda), spectral intensity of P-polarization, reflectivity Rp(lambda), optical phase, wavelength, diffraction angle, spectroscopic ellipsometry parameters, alpha, beta, cos(delta), and tan(psi).

47. (currently amended) ~~The method of claim 19,~~ A method for determining overlay between a plurality of first structures in a first layer of a sample and a plurality of second structures in a second layer of the sample, the method comprising:

providing targets A, B, C and D that each include a portion of the first and second structures,

wherein the target A is designed to have an offset Xa between its first and second structures portions,

wherein the target B is designed to have an offset Xb between its first and second structures portions,

wherein the target C is designed to have an offset Xc between its first and second structures portions,

wherein the target D is designed to have an offset Xd between its first and second structures portions,

wherein each of the offsets Xa, Xb, Xc and Xd is different from zero, Xa is an opposite sign and differ from Xb, and Xc is an opposite sign and differs from Xd;

illuminating the targets A, B, C and D with electromagnetic radiation to obtain spectra S_A, S_B, S_C, and S_D from targets A, B, C, and D, respectively; and

determining and storing any overlay error between the first structures and the second structures using a scatterometry technique based on the obtained spectra S_A, S_B, S_C, and S_D and without using calibration or modeling data to determine any overlay error.

wherein obtaining the spectra S_A, S_B, S_C, and S_D comprises acquiring radiation from the targets A, B, C, and D using an imaging spectrometer, and

wherein an illumination and imaging NA's of the ~~spectroscopic~~ imaging spectrometer ~~system~~ are chosen to optimize the performance of the instrument on scattering structures by ensuring that only the zero'th diffraction order is collected.

48. (currently amended) The method of claim 47, wherein the ~~spectroscopic imaging system~~ imaging spectrometer is an imaging spectroscopic ellipsometer.

49-50. (cancelled)

51. (original) The method of claim 1, wherein obtaining the spectra S_A, S_B, S_C, and S_D comprises acquiring radiation from the targets A, B, C, and D using an optical apparatus, wherein the radiation is acquired at simultaneous, multiple angles of illumination.

52. (original) The method of claim 19, further comprising focusing the optical tool only for illuminating a one of the targets A, B, C, and D and not refocusing the optical tool for illuminating the other three of the targets A, B, C, and D.

53-56. (cancelled)

57. (currently amended) A system for determining overlay between a plurality of first structures in a first layer of a sample and a plurality of second structures in a second layer of the sample, comprising:

a scatterometry module for illuminating the targets A, B, C and D with electromagnetic radiation to obtain spectra S_A, S_B, S_C, and S_D from targets A, B, C, and D, respectively ; and

a processor operable for determining any overlay error between the first structures and the second structures using a ~~linear approximation~~ a scatterometry technique based on the obtained spectra S_A, S_B, S_C, and S_D,

wherein targets A, B, C and D each include a portion of the first and second structures,

wherein the target A is designed to have an offset Xa between its first and second structures portions,

wherein the target B is designed to have an offset Xb between its first and second structures portions,

wherein the target C is designed to have an offset Xc between its first and second structures portions,

wherein the target D is designed to have an offset Xd between its first and second structures portions, ~~and~~

wherein each of the offsets Xa, Xb, Xc and Xd is different from zero, Xa is an opposite sign and differ from Xb, and Xc is an opposite sign and differs from Xd,

wherein the scatterometry module is an optical apparatus in the form of (i) a spectroscopic normal incidence reflectometer and an oblique incidence spectroscopic ellipsometer, (ii) a spectroscopic normal incidence polarized reflectometer and an oblique incidence spectroscopic ellipsometer, (iii) a spectroscopic normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer, or (iv) a spectroscopic near-normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer.

58. (original) The system of claim 57, wherein determining any overlay error comprises:

determining a difference spectrum D1 from the spectra S_A and S_B;

determining a difference spectrum D2 from the spectra S_C and S_D;

determining any overlay error by performing a linear approximation based on the difference spectra D1 and D2.

59. (original) The system as recited in claim 58, wherein the linear approximation is based on a property P1 of the difference spectrum D1 and a property P2 of the difference spectrum D2.

60. (original) The system of claim 57, wherein the targets A, B, C and D are disposed along a substantially straight line.

61. (original) The system of claim 60, wherein the target B is disposed between the target A and the target C, and the target C is disposed between the target B and the target D.

62. (original) The system of claim 57, wherein the targets A, B, C and D are disposed in a two dimensional configuration.

63. (original) The system of claim 62, wherein the targets A and B are disposed along a first axis, the targets C and D are disposed along a second axis, and the first axis and the second axis are substantially parallel.

64. (original) The system of claim 57, wherein the processor is further operable for:

producing an additional target E, the additional target E including a portion of the first and second structures with an offset Y there between;

illuminating the additional target E with electromagnetic radiation to obtain spectra S_E; and

wherein the determining any overlay error is further based on the spectrum S_E.

65-86. (cancelled)

87. (currently amended) The system of ~~claim 65~~ claim 57, wherein the optical apparatus is a system comprising a spectroscopic normal incidence reflectometer and an oblique incidence spectroscopic ellipsometer.

88. (currently amended) The system of ~~claim 65~~ claim 57, wherein the optical apparatus is a system comprising a spectroscopic normal incidence polarized reflectometer and an oblique incidence spectroscopic ellipsometer.

89. (currently amended) The system of ~~claim 65~~ claim 57, wherein the optical apparatus is a system comprising a spectroscopic normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer.

90. (currently amended) The system of ~~claim 65~~ claim 57, wherein the optical apparatus is a system comprising a spectroscopic near-normal incidence polarized differential reflectometer and an oblique incidence spectroscopic ellipsometer.

91-94. (cancelled)

95. (original) The system of claim 57, wherein at least one of the spectra S_A, S_B, S_C, and S_D comprises electromagnetic radiation that is unpolarized or selectively polarized or selectively analyzed.

96. (original) The system of claim 57, wherein at least one of the spectra S_A, S_B, S_C, and S_D comprises electromagnetic radiation that is unpolarized reflected light, polarized light with the electric field substantially parallel to a symmetry axis of at least one set of structures of at least one of the targets A, B, C or D, polarized light with the electric field substantially perpendicular to a symmetry axis of at least one set of structures of at least one of the targets A, B, C or D, polarized light with the electric field at an angle with respect to a symmetry axis of at least one set of structures of at least one of the targets A, B, C or D, right-hand circularly polarized radiation, or left-hand circularly polarized radiation.

97. (original) The system of claim 59, wherein the properties P1 and P2 of the difference spectra D1 and D2 each are selected from a group consisting of light noise, stability, drift, spectral characteristics, and light level.

98. (original) The system of claim 57, wherein the illuminating the targets A, B, C and D with electromagnetic radiation takes place substantially at different times such that the corresponding spectra S_A, S_B, S_C, and S_D are obtained at substantially different times.

99. (original) The system of claim 57, wherein the illuminating the targets A, B, C and D with electromagnetic radiation takes place substantially simultaneously such that the corresponding spectra S_A, S_B, S_C, and S_D are produced substantially simultaneously.

100. (original) The system of claim 57, wherein the illuminating the targets A, B, C and D with electromagnetic radiation takes place substantially simultaneously for at least two of the targets A, B, C and D.

101. (original) The system of claim 59, where determining the properties P1 and P2 comprises obtaining or processing one or more of radiation characteristics of the difference spectra D1 and D2, respectively, selected from a group consisting of intensity, spectral intensity of diffracted radiation, R(lambda) of different radiation, spectral intensity of transverse electric field polarization R(Te, lambda), spectral intensity of transverse magnetic field polarization R(Tm, lambda), spectral intensity of S-polarization reflectivity Rs (lambda), spectral intensity of P-polarization, reflectivity Rp(lambda), optical phase, wavelength, diffraction angle, spectroscopic ellipsometry parameters, alpha, beta, cos(delta), and tan(psi).

102-111. (cancelled)